

# CO<sub>2</sub> Control User's Guide



## CO<sub>2</sub> Controller for miniature incubators

- Precise CO<sub>2</sub> Control throughout the experiment
- Media pH control
- Compatible with any perfusion system
- Miniature incubators for any microscope
- Compatible with Imaging systems



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## Specifications

**Range** 0 to 20% CO<sub>2</sub>; ships calibrated to provide 5% level of CO<sub>2</sub> inside miniature incubators TC-MIS, TC-MI, or any custom enclosure

**Input**

150PSI max

**Sensors**

uses built-in CO<sub>2</sub> sensor

**Feedback**

from CO<sub>2</sub> sensor

adjustable GAINS

**Output**

750SCCM max

**Size (Controller) :** 8Wx4Hx9D in.

**Power Supply**

94 to 234 V AC, 50/60 Hz 35W

**Input Port**

4mm O.D. tubing (10-32 threaded)

includes adapters for different size tubing

**Output Port**

1/8in O.D. tubing (10-32 threaded)

## Introduction

The complete CO<sub>2</sub> control system comes with a controller, tubing to connect to miniature incubators, and fitting to connect to a source of CO<sub>2</sub> (a cylinder, for example, or a wall outlet). A source of CO<sub>2</sub> is required to operate the system. The CO<sub>2</sub> source needs to be regulated, since the maximum pressure of input CO<sub>2</sub> should not exceed 150 PSI. The controller ships adjusted for input pressure 40 PSI. During operation, the controller is continuously monitoring CO<sub>2</sub> inside the incubator.

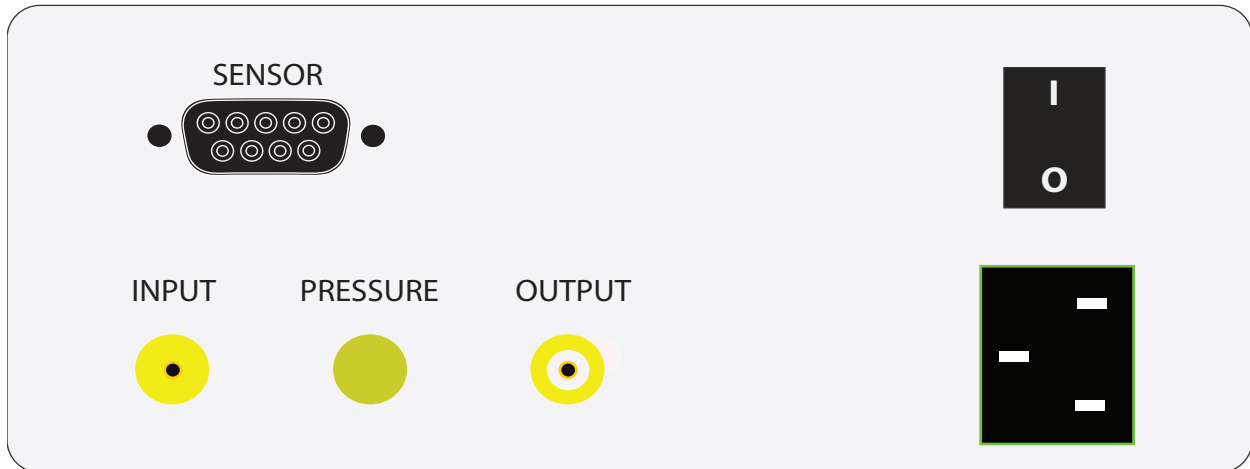
# Installation Guide

**1** Using provided fitting and clamps, connect CO2 source (cylinder or wall outlet) to the controller. Some tubing and additional fitting might be required to connect to your CO2 source as designs vary. Usually some luer-lock fitting or other easy-connect adapters are used to splice different diameter tubing connecting your source to 4mm O.D. translucent tubing, which fits inside INPUT port on the back of the controller. After splicing provided 4mm tubing to CO2 source, simply push the tubing inside IN port all way, and slightly pull back to clamp. In order to disconnect the source, push YELLOW rim inside the connector, and pull the tubing out. Make sure the regulator on CO2 source does not show more than 150 PSI of output pressure. Pressures around 40 PSI should be sufficient to operate the system. The controller ships tuned to work with 40 PSI input CO2 pressure

Similarly, insert a piece of 1/8in. O.D. BLACK tubing inside OUTPUT port on the back of the controller, and connect the other end of tubing to the incubator, or heated humidifier CO2-500ML. If a humidifier is used, connect the output of humidifier to the incubator. Make sure the provided check-valve is connected between the water bath or the incubator lid and the controller. Otherwise, you might have back flow of liquid inside the controller, which can result to the controller damage.

Connect power cable. Plug the power cable into wall outlet. Connect grey cable to DB-9 connector on one end, and to the incubator lid on another end.





**2** Turn the controller ON. The controller will self-calibrate itself for 5min, so make sure there are no residual CO2 under the lid of the incubator. Simply open the lid and let it ventilate for at least 30min. After 5min, The display will show INPUT CLOSED. Rotate the front knob to open INPUT - the controller is ready to use out of the box. Although the controller ships adjusted for use with your incubator, it can be re-adjusted using the procedure below.

**IMPORTANT:** since the controller calibrates in clean air, the incubator should be open for at least 30min before turning the controller ON.

1. By pressing the front button, go through displays to adjust CO2 % level (5% for example) and FLOW rate (in SCCM, 200 SCCM should be enough for small incubators). The lid can be placed on the incubator at this point.

2. Open the source of CO2 gas. Note: the input pressure should not exceed 150 PSI (usually 40 PSI is enough). Rotate the front button to open the input port - the display will show:

output %     0%

2. Press the front button until the display will show:

input PSI     1.0

Rotate the pressure regulator on the back clock-wise to adjust this reading to around 3 PSI (higher pressure might be required for larger incubators).

3. Go to DC% screen by pressing the front knob. Although the controller adjusts DC level by itself, you can decrease the level, if there is indication that too much gas flowing into the incubator.

4. AC level is used to increase sensitivity of internal sensors while regulating FLOW rate. Very low levels should be used for more stable operation.

Let the controller operate for at least 30min. If the level of CO2 does not reach 5% in several minutes, increase input pressure or/and DC/AC. Repeat if necessary.

**3** The input pressure can be reduced if you have indications that the flow of CO2 during operation is too high. IMPORTANT: small incubators require only very little flow of CO2 gas.

**4a** If you notice unstable operation, or the indications of wrong CO2 level inside the incubator, perform fine tuning procedure again.

**4b** NOTE: self-calibration assumes that the controller was not functional and the incubator was open for at least 30min before turning it ON and that the surrounding environment is clean air. If you have problems with your experiments and suspect, that the controller does not provide correct CO2 level, turn ON the controller after the incubator being without the lid for 30min in well ventilated room without any CO2 source attached.

## USING THE FRONT DISPLAY CONTROLS

Rotate the knob clock-wise to open the INPUT port, and rotate other direction to close - the display will show

INPUT CLOSED

Press the knob to get to CO2 settings and rotate to adjust:

SET CO2%                      5.0

Press again to go to SET FLOW level setting and rotate to adjust:

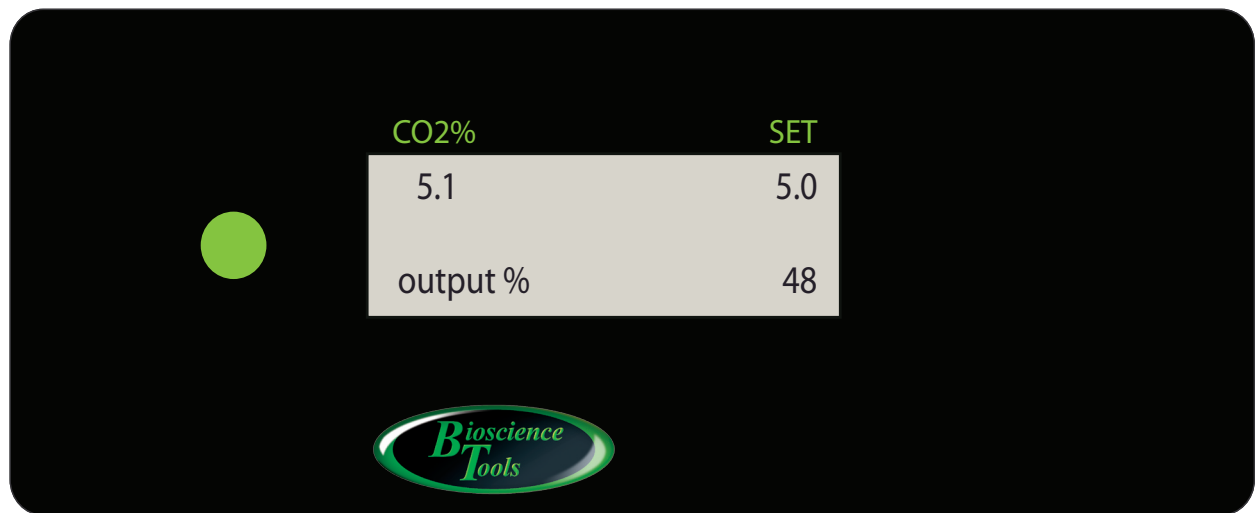
SET FLOW                      200

Press again to adjust input pressure (in PSI)

input PSI                      1.0

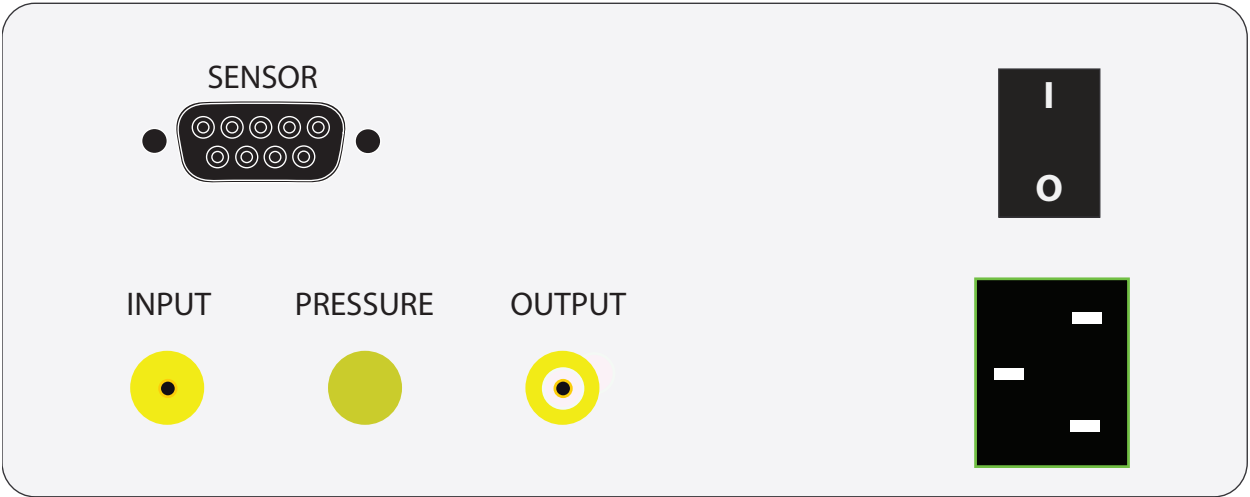
Rotate the pressure regulator on the back of the controller to increase pressure if required. Note: the pressure will not decrease until the controller starts supplying the gas to the output to relieve the internal pressure, so the lid may need to be open to decrease the input pressure.

## Front Panel Controls



| Front Panel Controls |   |
|----------------------|---|
| Knob                 | Sets CO2 level, FLOW rate, input PSI pressure, DC level and AC level, % |

# Inputs, Outputs and Back Panel controls



| Inputs & Outputs   |   |
|--------------------|---|
| INPUT port         | Connects to a source of CO2. Maximum input pressure is 150 PSI. |
| OUTPUT port        | Connects to the incubator to supply CO2.                        |
| DB-9 port          | Connects to the incubator to monitor CO2 level.                 |
| PRESSURE regulator | Adjust input pressure inside the controller.                    |

| Back Panel Controls      |  |
|--------------------------|--|
| Input Pressure regulator | Turn CLOCK-wise to increase inside pressure and turn ANTI-clockwise to reduce available pressure.. |



## Using Heated Humidifier CO2-500ML

A heated humidifier can be used to pre-heat and saturate the gas mixture with water, before the mixture enters the incubator. The humidifier consists of a heated base and a reservoir, which needs to be filled with distilled water. Fill the reservoir just enough to observe bubbles of gas coming out of input tubing, which has a female luer connector. The input tubing should be connected to BLACK output tubing coming out from a CO2 controller., with the check-valve placed between After connecting tubing, place the reservoir on the base.

Plug provided DC power adapter into the base and a wall power outlet. Turn the humidifier ON - an LED indicator will be ON. Let the base to warm up to facilitate water evaporation. After gas mixture enters the reservoir, it will be heated and mixed with water vapors.

NOTE: You can use the reservoir as an indicator of gas mixture flow rate. Usually, enough gas flow is provided to the incubator, as long as you can observe stream of bubbles coming up from the inflow tubing.

Using provided tubing, or any other tubing, connect the outflow MALE luer port to the incubator. Turn the CO2 controller ON to provide gas flow inside the incubator.

## Warranty

This product is warranted to be free from defects in material and workmanship for the duration of one year. Normal wear, or damage resulting from abuse, accident, alteration, misuse, service by an unauthorized party or shipping damage, are excluded from this warranty and are not covered. Bioscience Tools will repair or replace the defective product covered by this warranty free of charge if it is returned, postage prepaid, to Bioscience Tools, ph: 1-877-853-9755.

